

**GEOLOGY OF THE CASSINI IMPACT BASIN, MARS.** Edward F. Albin, Department of Space Sciences, Fernbank Science Center, 156 Heaton Park Drive (NE), Atlanta, Georgia 30307 (ed.albin@fernbank.edu).

More than 30 ancient impact basins have been identified on Mars [e.g., 1]. One such feature, located in the Arabia Terra region (24°N, 328°W), is the 400 km impact basin called Cassini (Figure 1). This basin's rim rises approximately 1 km above its floor, and the structure is situated within the middle Noachian heavily cratered uplands as mapped by Greeley and Guest [2]. Surrounding the impact structure are patches of cratered terrain dissected by valley network channels. Large Martian basins, like Cassini, are important for at least two reasons: a) they have excavated deep crustal and upper crustal rocks; and b) basin ejecta can serve as valuable regional stratigraphic markers. Very few "Cassini-sized" basins have been studied or mapped in detail [e.g., 3, 4].

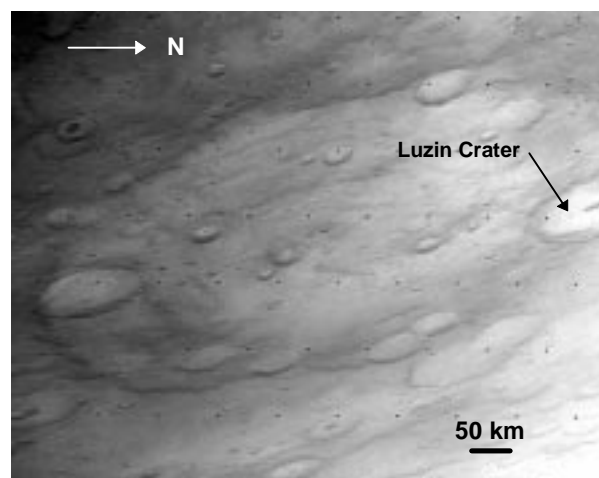


Figure 1. An oblique view of the Cassini impact basin. The northern rim has been modified by the large crater called Luzin (Viking Orbiter image 692A30).

Although Cassini has been extensively modified by gradational processes and the superposition of younger craters, much of the original basin structure and associated deposits are still discernible (see accompanying map). For instance, large sections of the basin walls (bw) are found intact -- particularly in the southern portion of the basin. The northern rim and walls have been obliterated and/or covered by the deposition of ejecta (c) from a large 100 km diameter crater, called Luzin, which is found just north of the basin.

Four geomorphic map units occur within Cassini basin. Groups of mountain peaks (m), interpreted as a discontinuous peak-ring, occur within the basin. Etched material (et) covers the southeastern basin interior, and it is suggested to consist of a combination of basin breccia and sedimentary material that has been etched by gradational processes. Ridged (rp) and smooth plains (sp) units also occupy interior sections of the basin. The ridged plains, of likely volcanic origin, cover large areas of the northern and western sections of the basin floor. Smooth plains are typically

found within crater floors and are interpreted as sedimentary deposits.

Four additional geomorphic units are mapped outside the basin. Ridged (rp) and smooth plains (sp) occur in areas external to the basin's rim. The ridged plains material in areas adjacent to the basin were probably emplaced through fissure vents that were tied to the tectonic array of fractures created by the basin's formation. A radial dissected unit (rd), interpreted as weathered basin ejecta (Figure 2), occurs on the cratered uplands (cu) in areas adjacent to the basin's rim out to a maximum distance of approximately 1.5 basin radii. Basin ejecta can be recognized by the occurrence of radial grooves, ridges, and a generally etched surface appearance. Some unrecognized basin ejecta may be included in the cratered uplands unit.

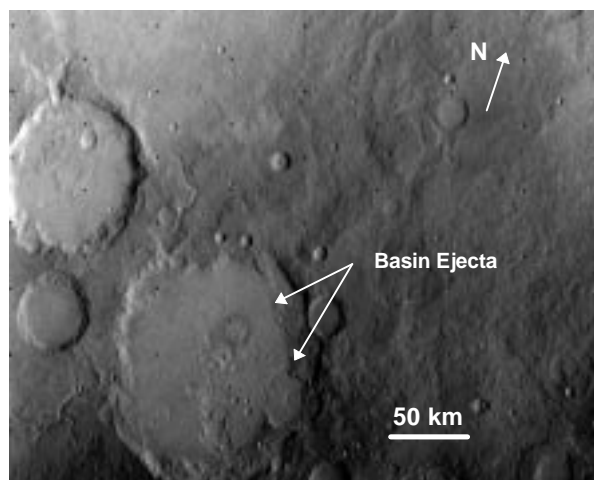
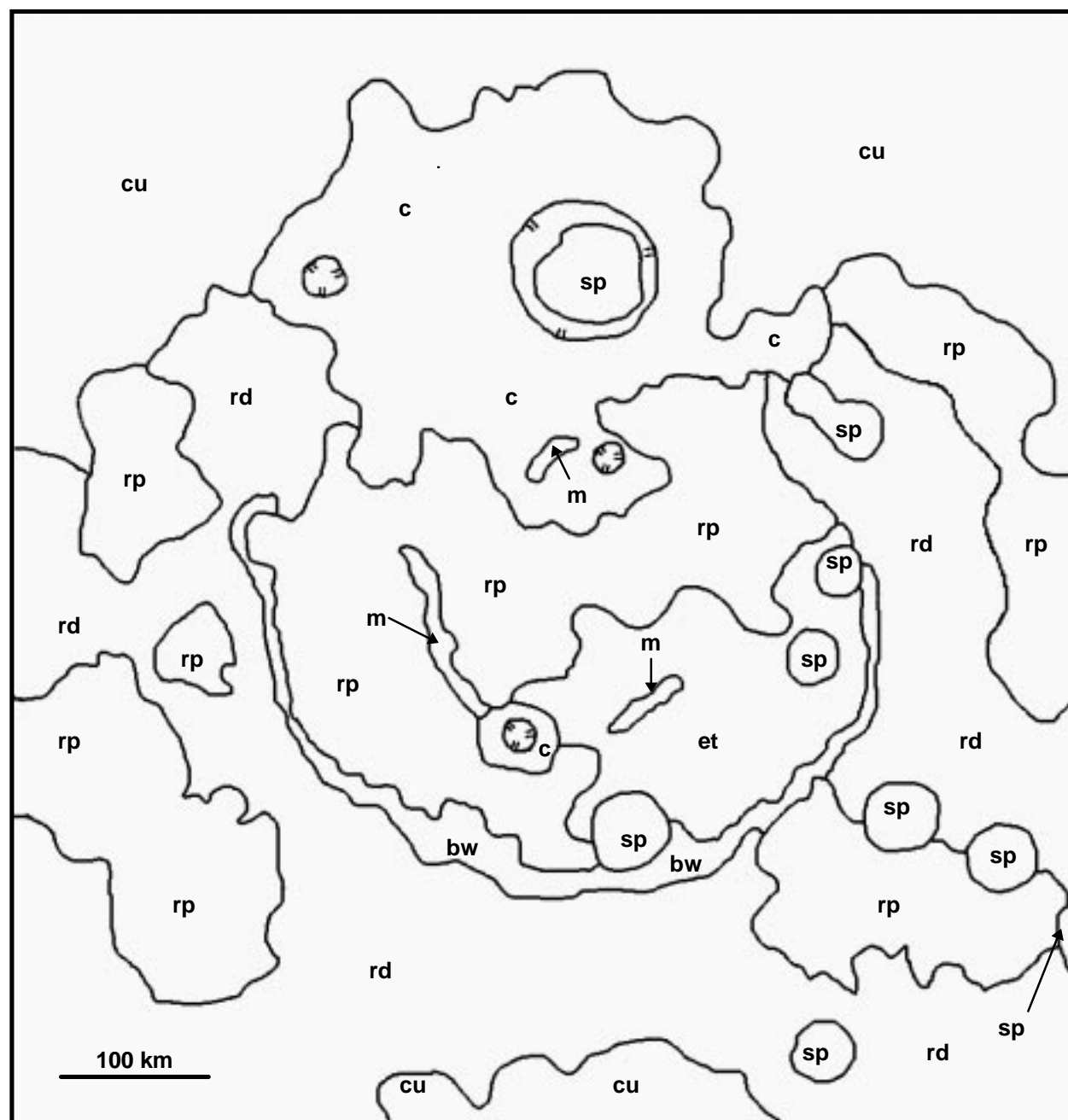


Figure 2. At the lower left is a 90km impact crater partially filled with what is interpreted to be basin ejecta. The crater is situated one basin radii or 200km to the southeast of the Cassini basin (Viking Orbiter image 339S22).

Cassini has a complex geologic history. The basin was produced on the cratered uplands during the late Noachian epoch. As a result of the impact event, the basin's walls (bw), mountainous peak ring (m), and ejecta units (et and rd) were emplaced. Lava flows filled areas within as well as in areas exterior to the basin's rim. The basin has since been modified (during the late Noachian and early Hesperian epochs) by the superposition of younger craters, gradational processes, and filling with wind blown dust deposits.

**References:** [1] Schultz R.A. and Frey H.V. (1990) *J. Geophys. Res.*, 87, 14175-14189. [2] Greeley R. and Guest J.E. (1987) *U.S. Geol. Surv. Misc. Inv. Ser. Map I-1802-B*. [3] Mouginis-Mark P.J. et al. (1982) *Proc. Lunar. Planet. Sci. Conf.*, 12A, 155-172. [4] Edgett K.S. (1991) *Proc. Lunar Planet. Sci. Conf.*, 21, 657-667.



Sketch map of the Cassini basin region: c - superimposed impact craters, of which Luzin (large crater on the northern rim) has the most extensive ejecta blanket; sp - smooth plains, considered to be of sedimentary origin; rp - ridged plains, smooth deposits with wrinkle ridges that are of probable volcanic origin; et - etched deposits, interpreted as brecciated basin ejecta; m - mountainous material, isolated peaks and groups of mountain peaks that form a discontinuous inner basin ring; rd - radial dissected unit, may represent weathered portions of the continuous basin ejecta blanket; cu - cratered uplands, the ancient pre-impact target surface.